

**CLASS 367, COMMUNICATIONS, ELECTRICAL: ACOUSTIC WAVE SYSTEMS AND DEVICES**

**SECTION I - CLASS DEFINITION**

This is the residual class for the communication of information or intelligence in the form of travelling stresses in an elastic medium which are detected or generated by electric signal handling means wherein the electric signal represents the communicated information or intelligence.

This class provides for subject matter not classifiable elsewhere comprising combinations of acoustic wave transmitters, receivers, and electric signal processors as well as electrical acoustic wave transmitters, receivers, and signal processors, per se, and subcombinations of such devices whose proximate functions are limited to use in acoustic wave communications.

**SECTION II - REFERENCES TO OTHER CLASSES**

**SEE OR SEARCH CLASS:**

- 33, Geometrical Instruments, particularly subclass 307 for acoustic wave borehole telemetering combined with gravity or earth's magnetic field responsive means to indicate the direction or inclination of the borehole.
- 73, Measuring and Testing, subclasses 570+ for the measuring and testing of vibration, per se, particularly subclasses 584+ for the measuring and testing of vibration by mechanical (acoustic) waves.
- 84, Music, subclasses 1+ for electrical tone generators combined with electric to acoustic wave energy transducers for use in the production of music.
- 178, Telegraphy, subclasses 31+ for typewriters which automatically type out words in response to spoken words.
- 181, Acoustics, subclasses 101+ for mechanical compressional wave systems for geophysical explorations; subclasses 123+ for miscellaneous mechanical sound echo systems; and subclass 125 for mechanical sound locating devices.
- 310, Electrical Generator or Motor Structure, for means to convert mechanical energy, including acoustic wave energy, into electric energy, and vice versa not restricted to use in systems and devices of this class (367) type.

- 340, Communications: Electrical, subclasses 384.1+ for electrically actuated audible signaling means; and subclass 621 for acoustic wave liquid level alarms.
- 342, Communications: Directive Radio Wave Systems and Devices (e.g., Radar, Radio Navigation), appropriate subclasses for radio wave echo systems.
- 369, Dynamic Information Storage or Retrieval, appropriate subclasses for electrical recording of continuous, audible signals.
- 379, Telephonic Communications, for means for communicating continuous, audible signals electrically.
- 434, Education and Demonstration, subclasses 2+ for devices relating to instruction in object detecting and ranging systems, e.g., radar or sonar systems.
- 455, Telecommunications, for the electrical conversion of audible acoustic wave signals to electromagnetic radiation, and vice versa.
- 505, Superconductor Technology: Apparatus, Material, Process, subclasses 150+ for high temperature ( $T_c$  30 K) superconducting device, and particularly subclasses 202+ for electric communication system containing transmitter or receiver of pulse, digital, or electromagnetic radio, television, or radar wave form.
- 606, Surgery, subclasses 2+ for electrical diagnostic devices utilizing ultrasonic acoustic waves.

**SUBCLASSES**

- 1 SONAR COUNTER-MEASURES:**  
This subclass is indented under the class definition. Subject matter comprising decoys or jamming systems for rendering nonseismic echo systems or distance or direction finding systems ineffective.
- (1) Note. The nonseismic echo or distance or direction finding systems of this subclass type are the same as those defined in subclasses 87 and 118, respectively, below.
- 2 TRANSPONDER:**  
This subclass is indented under the class definition. Subject matter which receives acoustic wave energy from a remote source and, in

- response, transmits radiant energy (e.g., radio or acoustic wave energy) to a remote point.
- 3 Sonobuoys and sonobuoy systems:**  
This subclass is indented under subclass 2. Subject matter which includes an underwater acoustic wave receiver, the output of which modulates a radio transmitter contained in a buoy.
- SEE OR SEARCH CLASS:  
441, Buoy, Rafts, and Aquatic Devices, subclasses 1+ for buoys, per se.
- 4 With component activating or deployment means:**  
This subclass is indented under subclass 3. Subject matter including structure which automatically renders an element or elements of the sonobuoy operative during descent or after entering the water.
- 5 With plurality of sonobuoys:**  
This subclass is indented under subclass 3. Subject matter in which two or more receiver-transmitter devices are employed.
- 6 With plurality of transponders:**  
This subclass is indented under subclass 2. Subject matter in which two or more receiver-transmitter devices are employed.
- 7 ACOUSTIC IMAGE CONVERSION:**  
This subclass is indented under the class definition. Subject matter wherein acoustic waves reflected or refracted from an object are used to form a visual representation of the exterior of the object or to form an electrical signal or record from which a visual representation of the object may be derived.
- SEE OR SEARCH CLASS:  
73, Measuring and Testing, subclasses 596+ for acoustic imaging of the interior of an object.  
348, Television, subclass 163 for acoustic imaging wherein the means which forms the visual representation is a television system.  
600, Surgery, subclass 400 for acoustic imaging of the eye; subclass 500 for detecting blood vessel pulsation, and subclass 509 for detecting electrical heart beat signals.
- 8 Acoustic holography:**  
This subclass is indented under subclass 7. Subject matter in which the visible image is reconstructed from data derived from the interference pattern of the reflected or refracted acoustic waves and a coherent reference acoustic wave or from electrical signals representative of such data.
- SEE OR SEARCH CLASS:  
73, Measuring and Testing, subclasses 603+ for acoustic image conversion involved in measuring or testing.
- 9 Seismic display:**  
This subclass is indented under subclass 8. Subject matter wherein the reflected or refracted acoustic waves travel through the earth.
- 10 Liquid or deformable surface holography:**  
This subclass is indented under subclass 8. Subject matter in which the reflected or refracted acoustic waves are projected onto a fluid or other elastic surface to create a ripple pattern.
- 11 With memory means:**  
This subclass is indented under subclass 7. Subject matter including means to store the information or intelligence being handled.
- 12 BEAM STABILIZATION OR COMPENSATION:**  
This subclass is indented under the class definition. Subject matter wherein the acoustic waves are received or radiated in a directional pattern and wherein means are provided to maintain a desired attitude of the pattern regardless of movement of the support for the receiving or radiating means, or wherein means is provided to counteract or neutralize undesired effects due to movement of the support for the receiving or radiating means (e.g., to correct for pitch, roll, or yaw of a vessel).
- 13 TESTING, MONITORING, OR CALIBRATING:**  
This subclass is indented under the class definition. Subject matter having means which determines the accuracy, operability, or operating characteristics of acoustic wave systems and elements of the class type.

**14 SEISMIC PROSPECTING:**

This subclass is indented under the class definition. Subject matter wherein the medium through which the waves travel comprises the earth or other planetary body and the system or element provides an indication of the characteristics or location of discontinuities (e.g., strata or foreign bodies) within the medium.

**SEE OR SEARCH CLASS:**

- 181, Acoustics, subclasses 101+ for seismic prospecting systems which do not involve the handling of electric signals which contain geophysical information.
- 702, Data Processing: Measuring, Calibrating, or Testing, subclasses 14+ for computer and data processing system especially designed to be used with seismic prospecting systems.

**15 Offshore prospecting:**

This subclass is indented under subclass 14. Subject matter wherein the medium (earth) through which the acoustic waves travel is covered by a body of water and wherein the acoustic waves either emanate from the medium and travel through the water to a detector or are detected at the medium/water interface.

**16 Transducer position control:**

This subclass is indented under subclass 15. Subject matter wherein the relative depth or location of the acoustic wave source or receiver is selectively varied or maintained constant.

- (1) Note. Subject matter wherein the transducer is merely moved, e.g., towed, is not classifiable in this subclass or the subclasses indented hereunder without some provision for selectively changing its path of motion or to maintain it in a certain path against external influences.

**17 Hydromechanical:**

This subclass is indented under subclass 16. Subject matter wherein the position of the transducer is controlled by structure interacting dynamically with the water surrounding the transducer.

- (1) Note. Subject matter under subclass type is frequently referred to in the art as a "paravane".

**18 Fluid variation:**

This subclass is indented under subclass 16. Subject matter wherein the position of the transducer is controlled by varying the buoyancy of the transducer or of structure attached to it (e.g., towing cable).

**19 Transducer cable location determination:**

This subclass is indented under subclass 15. Subject matter wherein the detector is attached to a line (i.e., towing, mooring, and/or communication line) and the distance of the line from some other object (e.g., another such line) is measured.

**SEE OR SEARCH CLASS:**

- 114, Ships, subclasses 242+ for the towing, per se, of waterborne devices.

**20 Multiple hydrophone cable systems:**

This subclass is indented under subclass 15. Subject matter having a plurality of detectors or sets of detectors each attached to different ones of a plurality of communication and/or towing lines.

**SEE OR SEARCH CLASS:**

- 114, Ships, subclasses 242+ for the towing, per se, of waterborne devices.

**21 Signal processing:**

This subclass is indented under subclass 15. Subject matter wherein electric signals representative of the detected acoustic waves or constituents of such signals are distinguished from one another or from other kinds of signals (e.g., noise) and/or wherein the information or intelligence contained in such signals pertaining to the characteristics or location of the discontinuity is identified.

**SEE OR SEARCH CLASS:**

- 702, Data Processing: Measuring, Calibrating, or Testing, subclasses 14+ for computer and data processing system especially designed to be used with seismic prospecting systems, particularly subclass 17 for filtering or noise reduction.

- 22 Transducer output weighting:**  
This subclass is indented under subclass 21. Subject matter wherein the electric signal outputs of two or more acoustic wave detectors responding to the same acoustic wave input are made to differ from one another by a certain amount.
- 23 Controlled source signalling:**  
This subclass is indented under subclass 21. Subject matter wherein the acoustic wave source is controlled to emit a certain acoustic wave format.
- 24 Reverberation removal:**  
This subclass is indented under subclass 21. Subject matter wherein the effects of the internal reflection of acoustic waves within the body of water itself are eliminated from or attenuated in the electric signals.
- 25 Well logging:**  
This subclass is indented under subclass 14. Subject matter wherein the deflected acoustic waves are detected by means which travels through a passageway in the earth.
- SEE OR SEARCH CLASS:  
73, Measuring and Testing, subclasses 152.01+ for a well logging, per se, wherein the logging is not a purely electrical test or a purely magnetic test, especially subclasses 152.02+ for a process or an apparatus for borehole formation logging wherein the logging is not a purely electrical test or a purely magnetic test.
- 26 Threshold set system:**  
This subclass is indented under subclass 25. Subject matter wherein detected waves are converted to electrical signals having a characteristic (e.g., amplitude, timing) which is compared with a standard to determine the acceptability of the signal by the system.
- 27 Time interval measurement:**  
This subclass is indented under subclass 25. Subject matter wherein the time interval between the transmission and detection of an acoustic wave is used to determine some characteristic of the acoustic medium (i.e., earth).
- 28 Amplitude measurement:**  
This subclass is indented under subclass 25. Subject matter wherein the detected acoustic wave is converted to an electric signal whose amplitude is used to determine some characteristic of the acoustic medium (i.e., earth).
- 29 Peak amplitude:**  
This subclass is indented under subclass 28. Subject matter wherein the maximum amplitude of the signal is used to determine some characteristic of the acoustic medium.
- 30 Amplitude comparison:**  
This subclass is indented under subclass 28. Subject matter wherein differences in amplitudes are used to determine some characteristic of the acoustic medium.
- (1) Note. The difference of this subclass type may be expressed as ratios of amplitudes.
- 31 Of noncompressional acoustic wave energy:**  
This subclass is indented under subclass 28. Subject matter wherein the energy of propagating stresses other than compressional stresses is measured.
- (1) Note. Propagating stresses of this subclass type include shear waves, surface waves (which may be referred to as "Rayleigh", "Love", "tube" or "Stoneley" waves), and refracted waves (which may be referred to as "head" or "conical" waves).
- 32 Frequency dependent determination:**  
This subclass is indented under subclass 28. Subject matter wherein the amplitude measurement involves the utilization or finding of a frequency characteristic of the seismic signal.
- 33 Depth recording or control:**  
This subclass is indented under subclass 25. Subject matter wherein an electric signal representing the location of the detector in the passageway is recorded or utilized by the system.
- SEE OR SEARCH CLASS:  
73, Measuring and Testing, subclasses 152.01+ for a well logging, per se, wherein the logging is not a purely

electrical test or a purely magnetic test, especially subclasses 152.02+ for a process or an apparatus for borehole formation logging wherein there is a measurement of depth being correlated with another borehole measurement being made and the logging is not a purely electrical test or a purely magnetic test.

**34 Received signal cycle discrimination:**  
This subclass is indented under subclass 25. Subject matter wherein particular cycles of the received signals are analyzed or processed to provide particular information or improved signal-to-noise response.

**35 Borehole or casing condition:**  
This subclass is indented under subclass 25. Subject matter wherein the information or intelligence pertains to the passageway itself or to the lining of the passageway.

SEE OR SEARCH CLASS:

73, Measuring and Testing, subclasses 152.01+ for a borehole testing, per se, wherein the test is not a purely electrical test or a purely magnetic test, especially subclass 152.57 for a process or an apparatus for testing a borehole casing condition wherein the test is not purely electrical or purely magnetic.

**36 Land-refraction type:**  
This subclass is indented under subclass 14. Subject matter wherein alterations in the paths of acoustic waves due to their passage through a discontinuity into a medium of different velocity are detected and used to represent characteristics or the location of the discontinuity.

**37 Land-reflection type:**  
This subclass is indented under subclass 14. Subject matter wherein alterations in the paths of acoustic waves deflected from a discontinuity without passing through it are detected and used to represent characteristics of or the location of the discontinuity.

**38 Signal analysis and/or correction:**  
This subclass is indented under subclass 37. Subject matter wherein various electrical signals representative of the detected acoustic waves or constituents of such signals are distinguished from one another or from other kinds of signals (e.g., noise) and/or wherein the information or intelligence contained in such signals pertaining to the characteristics or location of the discontinuity is identified.

SEE OR SEARCH CLASS:

702, Data Processing: Measuring, Calibrating, or Testing, subclasses 14+ for computer and data processing system especially designed to be used with seismic prospecting systems, particularly subclass 17 for filtering or noise reduction.

**39 Random signal correlation:**  
This subclass is indented under subclass 38. Subject matter wherein the information or intelligence is the degree of linear relationship identified by comparing the signal with some stochastic characteristic of the transmitted or other reference signal.

**40 Received correlation:**  
This subclass is indented under subclass 38. Subject matter wherein the information or intelligence is identified by comparing the signal with signals from other detectors in the system or with different time segments in the same signal.

(1) Note. Subject matter of this subclass type includes visual correlation of signals or records of signals by a person.

**41 Transmitted correlation:**  
This subclass is indented under subclass 38. Subject matter wherein an acoustic wave emitted by the system and reflected by a discontinuity is detected and the information or intelligence therein identified by comparing the signal representative of the detected wave with a signal representative of the emitted wave.

(1) Note. In the subject matter of this subclass type and signal representative of the emitted wave may be produced by the detector in response to the detection

of waves arriving thereat directly from the transmitter.

**42 Standard correlation:**

This subclass is indented under subclass 38. Subject matter wherein the information or intelligence is identified by comparing the signal representative of the detected wave with another signal of known shape.

- (1) Note. The signal of known shape may also drive the acoustic wave transmitter, the waves from which, reflected by discontinuities, becoming the detected waves of the subject matter of this subclass. The signal of known shape of this subclass type differ from "signal representative of the emitted wave" of the preceding subclass in that the signals driving the transmitter are not necessarily the same as signals representative of the wave actually emitted by the transmitter.

**43 Filters:**

This subclass is indented under subclass 38. Subject matter including means to attenuate and/or separate selected signals or constituent parts of complex signals.

**44 Comb filters:**

This subclass is indented under subclass 43. Subject matter wherein a plurality of selected signals or constituent parts of complex signals may be attenuated or separated simultaneously.

**45 Adaptive filters:**

This subclass is indented under subclass 43. Subject matter wherein the signal selecting characteristics of the filter are varied by the signal fed into the filter itself.

- (1) Note. Filters of this subclass type may appear to "learn" to pass the proper signal.

**46 Inverse filters:**

This subclass is indented under subclass 43. Subject matter wherein the selecting or attenuating characteristics are the opposite of similar characteristics of at least some part of the acoustic wave medium or system.

- (1) Note. The filtering characteristics of the subject matter of this subclass may be the inverse of such characteristics of the acoustic wave medium or system as, for example, the transmitting transducer, the receiving transducer, recording equipment, connecting cables, the earth and transducer to earth coupling.

**47 Amplitude:**

This subclass is indented under subclass 38. Subject matter wherein the distinction is made among the amplitudes of the various signals or constituents thereof.

**48 Phase:**

This subclass is indented under subclass 38. Subject matter wherein the distinction is made among the phases of the various signals or constituents thereof.

**49 Frequency:**

This subclass is indented under subclass 38. Subject matter wherein the distinction is made among the frequencies of the various signals or constituents thereof.

**50 Timing correction:**

This subclass is indented under subclass 38. Subject matter having means to correct or control the timing of the various signals in order to compensate for undesired influences of differences in acoustic wave paths.

**51 Dynamic timing correction:**

This subclass is indented under subclass 50. Subject matter wherein the amount of correction or control is variable during an interval.

**52 Normal moveout:**

This subclass is indented under subclass 51. Subject matter wherein the undesired influence is due to variations in the transmitter-to-distance.

**53 For dip:**

This subclass is indented under subclass 50. Subject matter wherein the difference in acoustic wave paths is caused by variations in the inclination of subsurface strata.

- 54 For weathering layer:**  
This subclass is indented under subclass 50. Subject matter wherein some or part of the paths lie in the zone of relatively low velocity material near the earth's surface and the effect of such layer is to be compensated for.
- 55 Timing mark generation:**  
This subclass is indented under subclass 38. Subject matter including means to represent a timed interval on a signal record or display.
- 56 Particular source-receiver array:**  
This subclass is indented under subclass 38. Subject matter wherein a plurality of receivers are particularly located relative to one another and to the transmitter of acoustic waves.
- 57 Vertical receiver or source array:**  
This subclass is indented under subclass 56. Subject matter wherein a plurality of receivers or sources are spaced from one another radially with respect to the center of the earth.
- 58 By receiver pattern arrangement:**  
This subclass is indented under subclass 38. Subject matter wherein a plurality of receivers are so located relative to one another as to produce signals which when combined are inherently analysed or corrected at least to some extent.
- 59 Compositing system:**  
This subclass is indented under subclass 38. Subject matter wherein signals from a plurality of receivers are combined.
- 60 Special digital system:**  
This subclass is indented under subclass 59. Subject matter wherein signals are in digital form and are composited by digital processing means other than a general digital computer.
- (1) Note. A compositing process intended to be performed under control of a program in a general purpose digital computer does not constitute a basis for classification in this subclass.
- SEE OR SEARCH CLASS:**  
702, Data Processing: Measuring, Calibrating, or Testing, subclasses 14 through 18 for a data processing measuring system in a seismology environment.
- 61 Beam steering:**  
This subclass is indented under subclass 59. Subject matter wherein information or intelligence from a certain direction is emphasized in the composite signal by delaying the signals from certain receivers.
- 62 Array weighting:**  
This subclass is indented under subclass 59. Subject matter wherein signals from certain ones of the receivers are modified in a predetermined manner before compositing.
- 63 With preliminary signal processing:**  
This subclass is indented under subclass 59. Subject matter wherein the signals are modified before being combined.
- 64 Optical processing:**  
This subclass is indented under subclass 38. Subject matter wherein an electrical signal representative of a detected acoustic wave is converted into electromagnetic radiation in the visible spectrum and is analyzed and/or corrected at least in part in that state.
- 65 Gain control:**  
This subclass is indented under subclass 38. Subject matter wherein the amplification or attenuation of an amplifier is variable.
- 66 Analog digital compatible systems:**  
This subclass is indented under subclass 65. Subject matter which may be applicable to the amplification or attenuation of either digital or analog signals.
- (1) Note. Disclosures classifiable in this subclass may include specific embodiments limited to, for example, analog signals but which disclosures are comprehensive enough to be applicable to digital signal gain control as well.

- 67 Digital:**  
This subclass is indented under subclass 65. Subject matter wherein the signal is in the form of discrete pulses.
- 68 Display systems:**  
This subclass is indented under subclass 37. Subject matter wherein the information or intelligence is converted from an electrical signal to a form (visually) perceptible to a human being.
- (1) Note. The nominal recitation or broad disclosure of display means is insufficient basis for classification in this subclass and the subclasses indented hereunder. For classification here some details of the means or steps which convert the signal from one form to another must be recited.
- 69 Well logging type:**  
This subclass is indented under subclass 68. Subject matter wherein the information or intelligence displayed is obtained from an acoustic wave detector which travels through a passageway in the earth.
- 70 Color:**  
This subclass is indented under subclass 68. Subject matter wherein the information or intelligence is displayed in various wavelengths.
- 71 CRT:**  
This subclass is indented under subclass 68. Subject matter wherein the information or intelligence is displayed on a cathode-ray tube.
- 72 3-D:**  
This subclass is indented under subclass 68. Subject matter wherein the display extends or appears to extend in three perpendicular directions in space.
- 73 Synthetic seismograms and models:**  
This subclass is indented under subclass 37. Subject matter wherein seismic-type signals or data are produced artificially.
- 74 Format conversion:**  
This subclass is indented under subclass 37. Subject matter wherein the information or intelligence pertaining to the discontinuity appears in an electric signal variable (e.g., amplitude) and is transferred to another signal variable (e.g., frequency).
- 75 Shear wave:**  
This subclass is indented under subclass 37. Subject matter wherein the acoustic waves consist of stresses in a direction or plane perpendicular to the direction of travel.
- 76 Telemetry:**  
This subclass is indented under subclass 37. Subject matter wherein electrical signals representative of the acoustic waves are transmitted from the detector to a remote part of the system.
- SEE OR SEARCH THIS CLASS, SUBCLASS:  
55, for seismic telemetering systems in which a time break signal represents the instant of generation of seismic energy.
- SEE OR SEARCH CLASS:  
340, Communications: Electrical, subclasses 870.01+ for generic telemetering systems.
- 77 Radio wave:**  
This subclass is indented under subclass 76. Subject matter wherein the signals are converted to and transmitted as invisible electromagnetic radiation.
- 78 Multiplex:**  
This subclass is indented under subclass 76. Subject matter wherein a plurality of distinct electric signals are transmitted over the same circuit virtually simultaneously.
- SEE OR SEARCH CLASS:  
703, Data Processing: Structural Design, Modeling, Simulation, and Emulation, subclass 5 for electrical analog computer simulator of geophysical phenomena, per se.

- 79 Time:**  
This subclass is indented under subclass 78. Subject matter wherein the distinct signals are separated from one another in time.
- 80 Frequency:**  
This subclass is indented under subclass 78. Subject matter wherein signals are distinguished from one another by their frequency.
- 81 WELLBORE TELEMETERING:**  
This subclass is indented under the class definition. Subject matter wherein information or control signals are transmitted through a passageway in the earth in the form of acoustic waves in a medium in the passageway comprised of material different from the surrounding earth.
- SEE OR SEARCH THIS CLASS, SUBCLASS:  
25, for wellbore telemetering of this subclass type combined with acoustic well logging means.
- SEE OR SEARCH CLASS:  
33, Geometrical Instruments, subclasses 306+ for acoustic wave wellbore telemetering systems combined with gravity or earth's magnetic field responsive means to determine and indicate the direction or inclination of the wellbore.  
340, Communications: Electrical, subclasses 853.1+ for nonacoustic wave wellbore telemetering, particularly subclasses 855.6 and 856.4 for an acoustic transducer with a nonacoustic communication link; and subclasses 870.01+ for generic telemetering systems.
- 82 Through drill string or casing:**  
This subclass is indented under subclass 81. Subject matter wherein the medium is, or is contained in, means connecting a drill bit in the passageway to driving apparatus on the earth's surface.
- 83 Through well fluids:**  
This subclass is indented under subclass 81. Subject matter wherein the medium is a liquid.
- 84 Rotary valve control:**  
This subclass is indented under subclass 83. Subject matter wherein the acoustic waves are generated by rotational movement of structure which modulates the well fluid flow.
- 85 Linear valve control:**  
This subclass is indented under subclass 83. Subject matter wherein the acoustic waves are created by linear movement of structure which modulates the flow of well fluid.
- 86 BOREHOLE TESTING:**  
This subclass is indented under the class definition. Subject matter wherein information or intelligence pertaining to the walls of a passageway through the earth is obtained from a device which travels through the passageway and emits acoustic waves into the medium contained within the passageway (e.g., air, water) which are reflected from the walls back to the device and detected.
- SEE OR SEARCH CLASS:  
73, Measuring and Testing, subclass 152.16 for using vibration to measure a parameter of a borehole or equipment therein.  
175, Boring or Penetrating the Earth, subclasses 40+ for borehole testing apparatus combined with significant boring or penetrating structure.
- 87 ECHO SYSTEMS:**  
This subclass is indented under the class definition. Subject matter wherein intelligence or information about a foreign object or other discontinuity in the medium is communicated in an acoustic wave reflected from the object or other discontinuity.
- SEE OR SEARCH THIS CLASS, SUBCLASS:  
1, for systems for jamming or interfering with echo systems.  
37, for echo systems wherein the medium is the earth.

- SEE OR SEARCH CLASS:  
342, Communications: Directive Radio Wave Systems and Devices (e.g., Radar, Radio Navigation), appropriate subclasses for radio wave echo systems.
- 88 Side scanning or contour mapping sonar systems:**  
This subclass is indented under subclass 87. Subject matter in which the paths of acoustic waves to and/or from the transmitter-receiver are directed laterally and downwardly into a body of water from a moving vessel on the body of water or in which a topographical record of the bottom of the body of water is produced from acoustic waves received at the moving vessel.
- (1) Note. The contour mapping devices of this subclass type are not limited to side scanning types.
- 89 Speed determination:**  
This subclass is indented under subclass 87. Subject matter for determining the rate of change of distance between a transmitting-receiving device and the acoustic wave reflector.
- SEE OR SEARCH CLASS:  
606, Surgery, subclasses 2+ for ultrasonic determination of blood flow.
- 90 By doppler effect:**  
This subclass is indented under subclass 89. Subject matter which utilizes the frequency shift of the reflected signal to determine the relative speed of the reflector.
- SEE OR SEARCH CLASS:  
73, Measuring and Testing, subclasses 861.18+ for determining the rate of flow of a fluid by measuring the doppler shift of an acoustic wave emitted into the fluid.
- 91 Vehicle mounted system for determining vehicle speed:**  
This subclass is indented under subclass 90. Subject matter in which the echo system is supported by a moving platform whose relative speed is determined.
- 92 Parametric sonar:**  
This subclass is indented under subclass 87. Subject matter which produces sum and difference frequencies by the nonlinear mixing of compressional waves within the propagating medium.
- (1) Note. Subject matter of this subclass type may be referred to as nonlinear or parametric acoustics.
- 93 Presence or movement only detection:**  
This subclass is indented under subclass 87. Subject matter which determines that a stationary or moving object is within a given area but does not determine the object's specific distance or direction from the detecting station.
- SEE OR SEARCH THIS CLASS, SUBCLASS:  
99+, for distance or direction finding echo systems.
- 94 By doppler effect:**  
This subclass is indented under subclass 93. Subject matter wherein the frequency shift of the received signal is utilized to determine presence or movement.
- 95 Returned signal used for control:**  
This subclass is indented under subclass 87. Subject matter wherein the reflected wave effects the regulation, energization, variation, de-energization, or some other operation of a device.
- (1) Note. The conventional energization of a mere indicating or measuring instrument is not considered control and is therefore insufficient basis for classification in this subclass.
- 96 External device:**  
This subclass is indented under subclass 95. Subject matter in which the device is not an integral part of the acoustic wave transmitting or receiving apparatus.
- 97 Receiver system:**  
This subclass is indented under subclass 95. Subject matter in which the device is a portion of the acoustic wave receiver itself.

- 98 Automatic gain or threshold control:**  
This subclass is indented under subclass 97. Subject matter in which the output signal level of the acoustic wave receiver or the minimum response level of some part of the receiver is controlled by the reflected wave.
- 99 Distance or direction finding:**  
This subclass is indented under subclass 87. Subject matter in which the extent of linear and/or relative angular spacing between an acoustic wave reflector and receiver is determined.
- SEE OR SEARCH CLASS:  
340, Communications: Electrical, subclass 621 for acoustic wave liquid level alarms.
- 100 With correlation or matched filtering:**  
This subclass is indented under subclass 99. Subject matter in which the degree of similarity between the transmitted and received signals is measured by multiplying the signals together and integrating the result, or in which a waveform of known shape is separated from random perturbing noise by optimal filtering.
- 101 Frequency modulation:**  
This subclass is indented under subclass 99. Subject matter in which the frequency of the transmitted acoustic waves is varied repetitively.
- 102 Linear modulation (e.g., sawtooth):**  
This subclass is indented under subclass 101. Subject matter in which the frequency increases or decreases repetitively at a constant rate between repetitions.
- 103 With beam steering, scanning, or focussing:**  
This subclass is indented under subclass 99. Subject matter in which directional characteristics of a transmitter or receiver are controlled so that the pattern of transmitted or received acoustic wave energy is varied or caused to converge.
- SEE OR SEARCH THIS CLASS, SUBCLASS:  
12, for beam stabilization or compensation.
- 104 By transducer movement:**  
This subclass is indented under subclass 103. Subject matter wherein the transmitting or receiving element is caused to change location or to turn about an axis.
- (1) Note. Transducers which are fixed relative to a vehicle and which only move by virtue of the movement of the vehicle are not considered beam steering or scanning transducers of this subclass type.
- 105 Transducer switching or gating:**  
This subclass is indented under subclass 103. Subject matter in which the directional characteristics are varied by selectively or repetitively opening or closing the electric signal path to the transducer.
- 106 With towing:**  
This subclass is indented under subclass 99. Subject matter in which at least a portion of the system is pulled or hauled by a vehicle.
- SEE OR SEARCH CLASS:  
114, Ships, subclasses 242+ for the towing, per se, of waterborne devices.
- 107 With indicator:**  
This subclass is indented under subclass 99. Subject matter which includes a means for displaying the distance or direction.
- 108 Digital readout:**  
This subclass is indented under subclass 107. Subject matter in which the indicator displays the distance or direction in numerical (as opposed to analog) form.
- 109 Rotating lamp:**  
This subclass is indented under subclass 107. Subject matter in which the display device comprises a light source which is moved in a circular path.
- 110 Color display:**  
This subclass is indented under subclass 107. Subject matter in which the indication is presented in various wavelengths of visible light.

- 111 Luminous array:**  
This subclass is indented under subclass 107. Subject matter in which the display device comprises a plurality of light emitting elements.
- 112 Alarm:**  
This subclass is indented under subclass 107. Subject matter which includes an alerting device (e.g., minimum depth alarm).
- 113 Cathode-ray tube:**  
This subclass is indented under subclass 107. Subject matter in which the display device is an evacuated tube with a luminescent screen activated by a controlled electron beam.
- 114 Meter:**  
This subclass is indented under subclass 107. Subject matter in which the display device is a meter of the moving coil type having a coil which pivots between permanent magnets, e.g., a volt meter or ammeter.
- 115 Permanent record:**  
This subclass is indented under subclass 107. Subject matter in which the display device provides a relatively long-lasting display of a transient indication.
- (1) Note. Subject matter of this subclass type includes, for example, a moving stylus display device.
- 116 Audible or tactile:**  
This subclass is indented under subclass 107. Subject matter wherein the indication is presented in such a way as to be perceivable through the sense of hearing or the sense of touch.
- 117 PLURAL TRANSMITTERS TO RECEIVER OR TRANSMITTER TO PLURAL RECEIVERS:**  
This subclass is indented under the class definition. Subject matter comprising systems in which two or more acoustic wave transmitters send acoustic signals to an acoustic wave receiver-transducer, or in which an acoustic wave transmitter sends acoustic signals to two or more acoustic wave receiver-transducers.
- 118 DISTANCE OR DIRECTION FINDING:**  
This subclass is indented under the class definition. Subject matter in which the extent of linear and/or relative angular spacing between an acoustic wave emitter and receiver is determined.
- (1) Note. The subject matter of this subclass may determine the range, azimuth and/or elevation of an acoustic wave source.
- (2) Note. The acoustic wave emitter need not be a part of the distance and/or direction finding system itself.
- SEE OR SEARCH CLASS:  
340, Communications: Electrical, subclass 621 for acoustic wave liquid level alarms.
- 119 With beam steering, scanning, or focussing:**  
This subclass is indented under subclass 118. Subject matter in which directional characteristics of the receiver are controlled so that the directions of optimal reception are varied or concentrated.
- SEE OR SEARCH THIS CLASS, SUBCLASS:  
12, for beam stabilization or compensation.
- 120 By transducer movement:**  
This subclass is indented under subclass 119. Subject matter wherein the directional characteristics are varied by changing the location of the transducer or by rotating it about an axis.
- 121 By electrical means:**  
This subclass is indented under subclass 119. Subject matter wherein the directional characteristics are varied or concentrated by varying some functional characteristic of the electrical circuitry associated with the transducer.
- (1) Note. Subject matter of this subclass type may consist of, for example, a plurality of transducers whose directions of maximum sensitivity do not coincide and which are connected to common signal processing circuitry in such a way that signals from individual transducers may be selectively attenuated to thereby

- effectively increase the sensitivity of the whole receiver in directions corresponding to the directions of maximum sensitivity of the transducer whose signals are unattenuated.
- 122 Transducer switching or gating:**  
This subclass is indented under subclass 121. Subject matter wherein the directional characteristics are varied by selectively or repetitively opening and closing the electrical signal path from the transducer.
- 123 With phase shifter or delay means:**  
This subclass is indented under subclass 121. Subject matter wherein the electrical circuitry associated with the transducer includes means for changing the travel time of a signal from the input of the means to its output.
- 124 By combining or comparing signals:**  
This subclass is indented under subclass 118. Subject matter wherein a signal is derived from the combination of the signals in two or more receiving channels (as by addition or multiplication) or from the measurement of the degree of similarity between such signals.
- 125 Phase comparison and/or correlation:**  
This subclass is indented under subclass 124. Subject matter in which the degree of similarity of received signals is measured by multiplying the signals together and integrating the results and/or by measuring the difference in phase between them.
- 126 Addition or subtraction:**  
This subclass is indented under subclass 124. Subject matter in which the combined signal is the result of the addition or subtraction of a signal in one channel to or from, respectively, a signal in another channel.
- 127 With time interval measuring means:**  
This subclass is indented under subclass 118. Subject matter in which the period of time elapsing between reception of compressional wave signals at separate transducers is measured.
- 128 With electromagnetic wave:**  
This subclass is indented under subclass 118. Subject matter in which a signal is transmitted through space in the form of electromagnetic waves.
- 129 With plurality of transducers:**  
This subclass is indented under subclass 118. Subject matter having two or more means to convert acoustic wave energy to an electrical signal.
- 130 With towing:**  
This subclass is indented under subclass 118. Subject matter in which at least a portion of the distance and/or direction finding device is pulled or hauled through the acoustic medium by a vehicle which is specifically separated from the device.
- SEE OR SEARCH CLASS:  
114, Ships, subclasses 242+ for the towing, per se, of waterborne devices.
- 131 UNDERWATER SYSTEM:**  
This subclass is indented under the class definition. Subject matter comprising an acoustic wave/electric signal transducer electrically connected to signal processing circuitry wherein the acoustic wave medium is water.
- (1) Note. The electric signal processing circuitry of this subclass type includes any circuit which is used to deliberately alter the signal. Mere interconnection means such as transducer leads do not constitute signal processing circuitry of this subclass type.
- SEE OR SEARCH THIS CLASS, SUBCLASS:  
1, for sonar counter-measures.  
2+, for transponders.  
3+, for sonobuoy transponders.  
7, for underwater acoustic image conversions.  
12, for underwater beam stabilization or compensation.  
15+, for offshore prospecting.  
87+, for underwater echo systems.  
117+, for underwater plural transmitters to receiver or transmitter to plural receivers system.

- 118+, for underwater distance or direction finding.
- 141+, for underwater transducers.
- 132 Analog speech communication:**  
This subclass is indented under subclass 131. Subject matter in which continuous acoustic wave signals having an amplitude, phase, or frequency proportional to voice modulations are transmitted and/or received.
- 133 Remote control:**  
This subclass is indented under subclass 131. Subject matter wherein acoustic waves are transmitted to activate or otherwise affect the operation of a device located at a distance from the acoustic wave source.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:  
197+, for speech or sound responsive selective control.
- 134 Telemetering:**  
This subclass is indented under subclass 131. Subject matter in which acoustic waves modulated by a specific source are transmitted, received, and demodulated.
- 135 RECEIVER CIRCUITRY:**  
This subclass is indented under the class definition. Subject matter comprising means to convert acoustic energy into electrical signals connected to electric signal processing means.
- (1) Note. The electric signal processing means of this subclass type may, in conjunction with the transducer, determine the presence or movement of an acoustic wave emitter.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:  
93, for transmitter-receiver systems which determine presence or movement of an acoustic wave reflector.
- 136 Responsive to intruder energy:**  
This subclass is indented under subclass 135. Subject matter wherein the circuitry is responsive to acoustic energy generated by the emplacement of a body within the region of sensitivity of the transducer.
- (1) Note. Subject matter of this subclass type includes, for example, intrusion alarms.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:  
93, for intrusion alarms responsive to disturbances in an acoustic wave field.
- SEE OR SEARCH CLASS:  
340, Communications: Electrical, subclass 566 for nonacoustic wave-type vibration detectors used to detect the intrusion or movement of a vibration producing body.
- 137 TRANSMITTER SYSTEMS:**  
This subclass is indented under the class definition. Subject matter comprising electrical wave generating circuitry coupled to an acoustic wave transducer-emitter.
- SEE OR SEARCH CLASS:  
341, Coded Data Generation or Conversion, subclasses 22+ for a keyboard controlled vibrating element for producing an encoded electrical signal.
- 138 With beam forming, shaping, steering, or scanning:**  
This subclass is indented under subclass 137. Subject matter in which directional characteristics of the transmitter are controlled so that the pattern of transmitted acoustic wave energy is varied or caused to converge.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:  
12, for beam stabilization or compensation.
- 139 Animal control:**  
This subclass is indented under subclass 137. Subject matter in which the emitted energy is used to affect the behavior of animals including insects and humans.
- 140 SIGNAL TRANSDUCERS:**  
This subclass is indented under the class definition. Subject matter comprising means to convert energy in the form of acoustic waves into energy in the form of electric signals or vice versa.

- (1) Note. The proximate functions of transducers classifiable in this subclass or in the subclasses indented hereunder limit them to use in acoustic wave systems of this class type. For a complete search for similar transducers of other or general utility, see the search notes to the appropriate subclasses indented hereunder.
- 141 Underwater type:**  
This subclass is indented under subclass 140. Subject matter wherein the acoustic waves propagate to or from the transducer in water.
- SEE OR SEARCH CLASS:  
73, Measuring and Testing, subclasses 570+ for vibration sensing apparatus utilized in the physical testing of materials.  
116, Signals and Indicators, subclass 27 for mechanical submarine bells.  
181, Acoustics, subclass .5 and 113-121 for miscellaneous acoustical systems such as supersonic systems having electroacoustical transducers.  
310, Electrical Generator or Motor Structure, subclasses 311+ for piezoelectric generators; and subclass 26 for magnetostrictive generators.
- 142 Exclusive-type transmitter:**  
This subclass is indented under subclass 141. Subject matter comprising transducers which are only capable of converting electric signals into acoustic waves.
- (1) Note. The subject matter of this subclass type is distinguished from the type of transducer which is capable of converting electric signals into acoustic waves and vice versa. Such transducers are excluded from this subclass and the subclasses indented hereunder.
- 143 Hydraulically driven vibrator:**  
This subclass is indented under subclass 142. Subject matter wherein reactive masses are oscillated by fluid pressure.
- 144 Air guns:**  
This subclass is indented under subclass 142. Subject matter wherein compressed gases are released underwater creating a travelling acoustic wave front in the water.
- SEE OR SEARCH CLASS:  
181, Acoustics, subclasses 119+ for similar subject matter which is not, however, operated electrically.
- 145 Explosives:**  
This subclass is indented under subclass 142. Subject matter wherein a solid, liquid, or gas explosive is ignited underwater to create a shock wave.
- SEE OR SEARCH CLASS:  
181, Acoustics, subclass 116 for solid and liquid explosives; and subclass 117 for gas explosives which are ignited under water by other than electrical means for acoustic effects.
- 146 Implosive devices:**  
This subclass is indented under subclass 142. Subject matter which are submersed in water and produce acoustic waves therein by abruptly reducing their volume.
- 147 Spark discharge devices:**  
This subclass is indented under subclass 142. Subject matter wherein underwater transducer produces an electric spark in the surrounding water which creates an acoustic shock wave.
- 148 Electrically driven underwater bells or sirens:**  
This subclass is indented under subclass 142. Subject matter comprising either an electrically driven bell or an electrically driven siren.
- (1) Note. The sirens and bells, per se, of this subclass type are of the type defined in subclasses 147 and 148, respectively, of Class 116, Signals and Indicators.
- SEE OR SEARCH CLASS:  
116, Signals and Indicators, subclass 27 for mechanically operated underwater bells and sirens.

**149 Exclusive-type receiver:**

This subclass is indented under subclass 141. Subject matter comprising transducers which are only capable of converting acoustic waves into electrical signals.

- (1) Note. The subject matter of this subclass type is distinguished from the type of transducer which is capable of converting acoustic waves into electric signals and vice versa. Such transducers are excluded from this subclass and the subclasses indented hereunder.

**150 With modifying lens:**

This subclass is indented under subclass 141. Subject matter combined with an acoustically transparent means which changes the direction of a ray of acoustic wave energy.

SEE OR SEARCH CLASS:

- 310, Electrical Generator or Motor Structure, subclass 335 for piezoelectric-type acoustic wave transducers having modifying lens.

**151 With reflector:**

This subclass is indented under subclass 141. Subject matter combined with an acoustically opaque means to change the direction of a ray of acoustic wave energy.

SEE OR SEARCH CLASS:

- 310, Electrical Generator or Motor Structure, subclass 335 for piezoelectric-type acoustic wave transducers having acoustic wave reflectors.

**152 With impedance matching means:**

This subclass is indented under subclass 141. Subject matter having means to mechanically couple the transducer to the medium in which it is immersed in such a way as to permit the maximum amount of energy transfer at selected wave lengths between the transducer and the medium.

**153 Plural transducer array:**

This subclass is indented under subclass 141. Subject matter comprising a plurality of transducers having electrically distinguishable inputs or outputs arranged in a definite spatial relationship with respect to one another.

- (1) Note. A plurality of spatially arranged transducer elements having only one electrical output or input at which the effects of the individual elements are indistinguishable is considered to a unitary transducer and not an array of this subclass type.

**154 Line array:**

This subclass is indented under subclass 153. Subject matter wherein a plurality of transducers are structurally mounted on or in a line.

**155 Piezoelectric:**

This subclass is indented under subclass 153. Subject matter wherein the transducers are of the piezoelectric type.

- (1) Note. Piezoelectric transducers of this subclass type are defined in subclass 157, below.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 157, piezoelectric underwater acoustical transducers, per se, of this class type.

**156 Magnetostrictive:**

This subclass is indented under subclass 153. Subject matter wherein the transducers are of the magnetostrictive type.

- (1) Note. Magnetostrictive transducers of this subclass type are defined in subclass 168, below.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 168, for underwater acoustical transducers, per se, of this class type.

**157 Piezoelectric:**

This subclass is indented under subclass 141. Subject matter wherein the energy is converted by a material which exhibits an electrostatic polarization when subjected to mechanical stress or which exhibits mechanical stress tending to produce deflection, expansion, or contraction when subjected to electrical stress.

- SEE OR SEARCH THIS CLASS, SUB-CLASS:  
180, for piezoelectric transducers of this class type not limited to underwater use.
- SEE OR SEARCH CLASS:  
310, Electrical Generator or Motor Structure, subclasses 311+ for piezoelectric elements and devices of general utility.
- 158 Head and tail mass:**  
This subclass is indented under subclass 157. Subject matter wherein the piezoelectric element has a mass acting as a driving or driven piston at one end of its axis and a relatively stationary inertial mass at the other end.
- 159 Elongated cylindrical element:**  
This subclass is indented under subclass 157. Subject matter wherein piezoelectric material is in the shape of an elongated cylinder.
- 160 Bending type:**  
This subclass is indented under subclass 157. Subject matter wherein the mechanical stresses applied to or produced in the piezoelectric element include a coplanar pair or oppositely directed moments of mechanical force.
- SEE OR SEARCH CLASS:  
310, Electrical Generator or Motor Structure, subclasses 330 through 332 for bending-type piezoelectric transducers of general utility.
- 161 Multimorph:**  
This subclass is indented under subclass 160. Subject matter having two piezoelectric elements so joined and oriented relative to one another that one expands while the other contracts to produce a bending-type stress in the composite structure.
- 162 With resonant or damping structure:**  
This subclass is indented under subclass 157. Subject matter wherein the piezoelectric element is combined with structure whose natural frequency of vibration is disclosed as being either the same as the operating frequency of the element or such as to absorb or attenuate
- undesired wave energy emanating from or applied to the piezoelectric element.
- SEE OR SEARCH CLASS:  
310, Electrical Generator or Motor Structure, subclasses 321 through 327 for similar subject matter of general utility.
- 163 With diaphragm:**  
This subclass is indented under subclass 157. Subject matter having a flexible member which couples vibrations in an acoustic medium to or from the piezoelectric element.
- 164 Single element having a plurality of electrodes:**  
This subclass is indented under subclass 157. Subject matter wherein a plurality of electrodes on its surface form a plurality of discrete radiating areas.
- SEE OR SEARCH CLASS:  
310, Electrical Generator or Motor Structure, subclass 366 for similar subject matter of general utility.
- 165 Specific support structure:**  
This subclass is indented under subclass 157. Subject matter having specific means to support the piezoelectric transducer.
- (1) Note. For purpose of classification in this subclass, the support structure must be more than nominally recited.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:  
173, for nonpiezoelectric transducer having similar support structure.
- SEE OR SEARCH CLASS:  
310, Electrical Generator or Motor Structure, subclasses 348+ for supports for piezoelectric elements of general utility.
- 166 Liquid filled:**  
This subclass is indented under subclass 157. Subject matter wherein the transducer is filled with a liquid for transmitting acoustic wave to or from a fluid medium.

- 167 Pressure compensating means:**  
This subclass is indented under subclass 157. Subject matter wherein means is provided to counteract the effects on the transducer of the static pressure of the surrounding water.
- 168 Magnetostrictive:**  
This subclass is indented under subclass 141. Subject matter wherein the acoustic wave energy causes or is caused by changes in the dimensions or internal stresses of a ferromagnetic material.
- SEE OR SEARCH CLASS:  
310, Electrical Generator or Motor Structure, subclass 26 for magnetostrictive transducers of general utility.
- 169 Elongated continuous type:**  
This subclass is indented under subclass 141. Subject matter wherein a single transducer is composed of multiple transducer elements spaced from one another in extended linear or arcuate formats.
- SEE OR SEARCH THIS CLASS, SUBCLASS:  
153, for similar arrays of a multiplicity of functionally distinct transducers.
- 170 Electret:**  
This subclass is indented under subclass 141. Subject matter wherein acoustic wave energy acts on or is caused by a dielectric body having separated, permanent electric poles of opposite polarity.
- SEE OR SEARCH CLASS:  
307, Electrical Transmission or Interconnection Systems, subclass 400 for electrets, per se.
- 171 Liquid filled transducer:**  
This subclass is indented under subclass 141. Subject matter wherein the transducer is filled with an acoustically transparent liquid.
- SEE OR SEARCH THIS CLASS, SUBCLASS:  
166, for fluid-filled piezoelectric transducers.
- 172 Transducer with pressure compensating means:**  
This subclass is indented under subclass 141. Subject matter wherein means is provided to counteract the effects on the transducer of the static pressure of the surrounding water.
- SEE OR SEARCH THIS CLASS, SUBCLASS:  
167, for similar pressure compensating means combined with piezoelectric transducers.
- 173 Transducer with support:**  
This subclass is indented under subclass 141. Subject matter having specific means to support the transducer.
- (1) Note. For purposes of classification in this subclass, the support structure must be more than nominally recited.
- SEE OR SEARCH THIS CLASS, SUBCLASS:  
165, for similar subject matter wherein the transducer is of the piezoelectric type.
- 174 Transducer with diaphragm:**  
This subclass is indented under subclass 141. Subject matter having a flexible member which couples vibrations in an acoustic medium to or from the transducer element.
- SEE OR SEARCH THIS CLASS, SUBCLASS:  
163, for similar subject matter wherein the transducer is of the piezoelectric type.
- 175 Diaphragm with electric driving coil:**  
This subclass is indented under subclass 174. Subject matter wherein the diaphragm is driven by an electromagnetic coil.
- 176 Transducer with resonant or damping structure:**  
This subclass is indented under subclass 141. Subject matter wherein the transducer element is combined with structure whose natural frequency of vibration is disclosed as being either the same as the operating frequency of the element or such as to absorb to attenuate undesired wave energy emanating from or applied to the element.

- SEE OR SEARCH THIS CLASS, SUB-CLASS:  
162, for similar subject matter wherein the transducer element is piezoelectric.
- 177 Towed land cables:**  
This subclass is indented under subclass 140. Subject matter comprising a plurality of transducers mounted in or on a cable-like structure which supports the transducers for movement with the cable-like structure.
- 178 Receivers:**  
This subclass is indented under subclass 140. Subject matter for use in acoustic wave systems to convert acoustic wave energy into electrical energy.
- 179 Pendulum type:**  
This subclass is indented under subclass 178. Subject matter wherein a body suspended from a fixed point swings in an arcuate manner in response to incident acoustic wave energy.
- 180 Piezoelectric:**  
This subclass is indented under subclass 178. Subject matter wherein acoustic wave energy is converted into electrical energy by a material which exhibits an electrostatic polarization when subjected to mechanical stress.
- 181 Capacitive:**  
This subclass is indented under subclass 178. Subject matter comprising an electrical capacitor whose electrical parameters are varied by changes in its mechanical parameters brought about by acoustic wave energy.
- (1) Note. Subject matter of this subclass type includes, for example, two spaced plates connectible in an electrical circuit, whose spacing is varied by the force of incident acoustic wave.
- 182 Moving coil:**  
This subclass is indented under subclass 178. Subject matter in which acoustic wave forces move an electric coil relative to a ferromagnetic core so as to induce electric signals in the coil.
- 183 Spider spring:**  
This subclass is indented under subclass 182. Subject matter having resilient means to support the coil radially with respect to the core in such a way as to permit relative movement of the coil axially with respect to the core.
- 184 Having arcuate movement:**  
This subclass is indented under subclass 182. Subject matter wherein the coil is supported for angular movement about an axis spaced from and transverse to the axis of the coil.
- 185 Moving magnet:**  
This subclass is indented under subclass 178. Subject matter wherein acoustic wave forces move a permanent magnet relative to an electric coil in such a way as to induce an electric signal in the coil.
- 186 Having arcuate movement:**  
This subclass is indented under subclass 185. Subject matter wherein the magnet is supported for angular movement about an axis spaced from and transverse to the axis of the coil.
- 187 Spider spring:**  
This subclass is indented under subclass 185. Subject matter having resilient means to support the magnet radially with respect to the coil in such a way as to permit relative movement of the magnet axially with respect to the coil.
- 188 Casing or housing:**  
This subclass is indented under subclass 178. Subject matter provided with enclosure means to separate the transducer from its environment.
- 189 Vibrator-type transmitter:**  
This subclass is indented under subclass 140. Subject matter comprising generators of long trains of periodic acoustic waves.
- 190 With feedback control:**  
This subclass is indented under subclass 189. Subject matter in which a portion of the output of the generator is used to control the operation of the generator itself.

**191 MISCELLANEOUS:**

This subclass is indented under the class definition. Subject matter not provided for by any of the preceding subclasses.

**197 SELECTIVE (E.G., REMOTE CONTROL):**

This subclass is indented under the class definition. Subject matter for controlling the operation of one or more devices to obtain a plurality of results by transmission of a designated one of plural distinctive acoustic control signals over a smaller number of communications channels than the number of distinct results.

- (1) Note. Included herein are plural addressable receiving devices.
- (2) Note. Underwater remote control is excluded from this subclass, and is classified in subclass 133.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 33, for selective control of acoustic well logging.
- 65+, for selective control of the gain of a land reflection type signal analyses and/or correction in seismic prospecting.
- 84, and 85, for valve control in acoustic wellbore telemetry.
- 95+, for acoustic echo systems where the returned signal is used for selective control.
- 133, for underwater selective remote control.

SEE OR SEARCH CLASS:

- 340, Communications: Electrical, subclasses 825+ for similar subject matter using communication lines other than acoustical, and the search notes thereto for other pertinent subject matter.
- 398, Optical Communication, subclasses 106 through 114 for selective optical remote control.

**198 Humanly generated sound or speech responsive (e.g., human whistle):**

This subclass is indented under subclass 197. Subject matter in which the control signals are actuated or modified in accordance with an audible mechanical vibration produced by a human being.

SEE OR SEARCH CLASS:

- 381, Electrical Audio Signal Processing Systems and Devices, subclass 110 for voice controlled audio signal systems.

**199 Frequency responsive actuation:**

This subclass is indented under subclass 197. Subject matter wherein each control signal is a vibratory wave having a distinctive frequency characteristic.

SEE OR SEARCH CLASS:

- 381, Electrical Audio Signal Processing Systems and Devices, subclass 110 for voice controlled audio signal systems.

**CROSS-REFERENCE ART COLLECTIONS**

The following subclasses are collections of published disclosures pertaining to various specified aspects of the electroacoustic communication art which do not form appropriate bases for subclasses in the foregoing classification. All copies of U.S. patents to be found in the following subclasses are cross-reference copies, the originals of which appear in the foregoing subclasses or elsewhere. Therefore, these cross-reference art collections serve primarily either as a starting point in searching this class or an indication of further fields of search inside or outside the class. In no case should any of these collections be considered exhaustive of the subject matter provided for by them.

**900 SONAR TIME VARIED GAIN CONTROL SYSTEM:**

Sonar systems in which the amplification factor of a receiver is changed as a function of expected attenuation of the received signal.

**901 NOISE OR UNWANTED SIGNAL REDUCTION IN NONSEISMIC RECEIVING SYSTEM:**

Receiving systems other than those used for detecting acoustic waves in earth wherein the

- effects of interference are diminished or compensated for.
- (1) Note. Excluded from this collection are conventional filtering techniques, time varied gain control systems, and side lobe reduction systems which are provided for in other cross-reference art collections in this class.
- 902 SPEED OF SOUND COMPENSATION:**  
Acoustic wave echo systems or distance and direction finding systems wherein correction is made for errors which would otherwise be introduced by variations in the propagation of acoustic waves.
- 903 TRANSMIT-RECEIVE CIRCUITRY:**  
Acoustic wave echo systems which permit alternate projection and detection of acoustic wave energy while using a single transducer.
- 904 DOPPLER COMPENSATION SYSTEMS:**  
Acoustic wave systems wherein correction is provided for errors which would otherwise occur because of an apparent frequency shift in an acoustic wave due to relative movement between source and receiver.
- 905 SIDE LOBE REDUCTION OR SHADING:**  
Acoustic wave echo systems or distance and direction finding systems in which signals received from portions of a transducer array other than the main lobe are diminished or eliminated, the directive pattern of an array being modified by adjusting the distribution of signal phase and/or amplitude over the array.
- 906 AIRBORNE SHOCK-WAVE DETECTION:**  
Acoustic wave systems for detecting airborne acoustic waves generated by the movement of a ballistic missile, projectile, or other shock-wave generating device through the air.
- 907 COORDINATE DETERMINATION:**  
Acoustic wave echo systems or distance or direction finding systems in which the receiving system produces at least a pair of numbers which define the location of the source (e.g., numbers representing ordinate and abscissa or range and bearing).
- 908 MATERIAL LEVEL DETECTION, E.G., LIQUID LEVEL:**  
Acoustic wave echo systems in which the reflector is a fluent material contained in a vessel.
- 909 COLLISION AVOIDANCE:**  
Acoustic wave echo systems or distance or direction finding systems for providing advance warning or impending impact of relatively moving objects.
- 910 PORTABLE SONAR DEVICES:**  
Acoustic wave echo systems or distance and direction finding systems which are made to be carried and operated by one person.
- 911 PARTICULAR WELL-LOGGING APPARATUS:**  
Subject matter comprising wellhole data acquisition systems using specific logging apparatus.
- 912 Particular Transducer:**  
This subclass is indented under subclass 911. Subject matter wherein the system uses a specific type of acoustic transducer to transmit and/or receive seismic waves.
- END